

NATURAL RESOURCES CONSERVATION SERVICE
PACIFIC BASIN AREA
CONSERVATION PRACTICE STANDARD

GRASSED WATERWAY

(Hectare, Acre)
CODE 412

DEFINITION

A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff.

PURPOSE

To convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding and to improve water quality.

CONDITIONS WHERE PRACTICE APPLIES

All sites where added capacity, vegetative protection, or both are required to control erosion resulting from concentrated runoff and where such control can be achieved by using this practice alone or combined with other conservation practices. This practice is not applicable where its construction would destroy important woody wildlife cover and the present watercourse is not seriously eroding.

CONSIDERATIONS

General. The most critical time in successfully installing grassed waterways is the period of vegetation establishment. Special protection such as mulch anchoring, straw or hay bale dikes, or diversion of runoff may be required until the vegetative cover is in place. Supplemental irrigation may also be necessary. The vegetation should be well established before large flows are permitted in the channel.

Landowners should be advised to avoid areas where forbs have been established when applying herbicides. Avoid using waterways as turn-rows during tillage and cultivation operations.

Wildlife should be considered in accordance with Pacific Basin standard, Upland Wildlife Habitat Management (645).

Livestock and vehicular crossings should be planned as part of the waterway to prevent damage to it, particularly the vegetation. Supplemental treatment (rock and gravel, geotextile, or controlled usage e.g. non-use during wet periods,) for these areas may be required.

Planning. The vegetative lining should be well established before the waterway is used as an outlet for other water management practices. This typically takes one year.

Consider locating waterways in the natural drainage pattern because they are easier to construct, are usually in a low place with less soil to move, and water naturally flows to eliminating the need for other land shaping.

Earthwork and planting of the vegetation should be timed so that there is sufficient moisture for growth and so that it is well established prior to expected runoff.

Many species of grass are easily damaged by extended periods of wetness. Waterways in sites prone to prolonged trickle flows may require additional features, to prevent damage to the vegetation. One method frequently used is a surface inlet and underground outlet (620) to carry base flows. No pipe or trenching should be planned for the area within the grassed waterway as excavated and backfilled soil is less erosion resistant than undisturbed soil.

The vegetative species selected for the waterway lining must be compatible with the soils, the moisture regime and seasonal fluctuations, anticipated maintenance, and the overall crop management system. The is of special importance when selecting perennial or reseeding type annual species

since they may become established outside of the waterway.

Water Quantity. This practice is used either to stabilize an active gully or serves as a stable outlet for contouring, contour stripcropping, diversions, terraces, water control structures, hillside ditches, underground outlets, and/or other surface water management practices.

The waterway may have effects on the components of the water budget, especially on volumes and rates of runoff.

Water Quality. When properly planned, designed and installed, this practice will reduce the erosion in concentrated flow areas, such as classic or ephemeral gullies. This may result in the reduction of sediment and other substances (primarily organic matter) delivered to the receiving waters. Vegetation may act as filter in removing some of the sediment delivered to the waterway, although this is not the primary function of a grassed waterway.

Any chemicals applied to the waterway in the course of treatment of the adjacent cropland may wash directly into the surface waters in the case where there is a runoff event shortly after spraying.

Consider:

1. Effects on erosion and the movement of sediment (with attached nutrients), pathogens, and other substances carried by runoff.
2. Filtering effects of vegetation on the movement of sediment and sediment-attached substances, especially along the sides of the waterway where runoff enters it.
3. Short-term and construction-related effects on downstream water resources.

DESIGN CRITERIA

Capacity. The minimum capacity of the waterway shall be that required to convey the peak runoff expected from a storm of 10-year frequency, 24-hour duration. The watershed used for hydrology computations shall be the total watershed that will contribute to the

waterway when all water management features of the farm plan are installed. When the waterway slope is less than 1 percent, out-of-bank flow may be permitted if such flow will not cause excessive erosion. The minimum channel capacity in such cases shall be that required to remove the water before the waterway vegetation is damaged. If prolonged wetness in fields is the resource problem being addressed (usually indicated by large channels with relatively flat grades), the Pacific Basin standards, Surface Drainage, Field Ditches, Mains or Laterals (607 or 608) may be more appropriate practices.

Velocity. Design velocities shall not exceed those obtained by using the procedures, "n" values, and recommendations in the NRCS NEH Part 650 - Engineering Field Handbook (EFH) - Chapter 7 or SCS-TP-61, Handbook of Channel Design for Soil and Water Conservation.

Cross Section. Waterways may be vee shaped, trapezoidal, or parabolic in cross section. Trapezoidal and V-shaped channels are usually constructed with equipment working parallel to the centerline of the waterway. Grade control can be difficult with this construction technique unless the operator is very proficient. Parabolic channels are usually built with equipment moving soil perpendicular to the centerline of the channel. Grade is generally easier to obtain, but a much wider area is needed for construction that working parallel to the centerline.

Width. The bottom width of trapezoidal waterways shall not exceed 30 meters (100 feet) unless multiple or divided waterways or other means are provided to control meandering of low flows.

Side Slopes. Side slopes shall not be steeper than a ratio of two horizontal to one vertical (2:1). They should be designed to accommodate the land user's equipment. General guidelines are that 2:1 slopes are the maximum maintainable and near the maximum stable for many soils. 3:1 slopes are the maximum maintainable by equipment.

Depth. The minimum depth of a waterway shall be such it will function effectively as an outlet for surface management features that empty into it. Design depths shall be deep enough that water will not be backed up into contributing diversions, terraces, hillside ditches, etc.

Drainage. Pacific Basin standards, Subsurface Drain (606), Underground Outlet (620), stone center waterways, or other suitable measures shall be provided for in the design for sites having prolonged flows, a high water table, or seepage problems.

Outlets. All grassed waterways shall have a stable, i.e. non-eroding, outlet with adequate capacity to prevent ponding or flooding damages. The outlet can be another vegetated channel, an earth ditch, a grade stabilization structure, or other suitable outlets.

Establishment of Vegetation. Grassed waterways will be vegetated according to Pacific Basin standard, Critical Area Planting (342).

PLANS AND SPECIFICATIONS

Prior to developing design and construction plans, survey data must be obtained. Such data shall include sufficient points to develop and show the grassed waterway layout, profile, cross sections, locate physical features (road, trees, watershed, etc.) and location of spoil placement. All surveys will be in accordance with NEH Part 650 - EFH - Chapter 1 and NEH Part 640 Technical Release 62.

General. Plans and specifications for grassed waterways shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Construction plans shall include a plan view drawn to scale, profiles, cross sections, and layout as a minimum. For waterways that do not include associated practices that must be installed simultaneously, approved job sheets and in the field staking may be sufficient. If additional conservation practices are included in the project, the information necessary to construct these practices will also be

conveyed on the plans. Development of plans will be guided by NEH Part 650 - EFH - Chapter 5.

Incidental information necessary to the construct the job will need to be either communicated in the construction specifications or carried on the construction drawings in the form of construction notes.

ENGINEERING SPECIFICATIONS

Some possible items that may need to be addressed in the job sheets, construction drawings or construction specifications for a project might be:

1. Removal of all trees, stumps, brush, and similar material from the site and disposing of them in a manner consistent with environmental concerns and proper functioning of the waterway.
2. Salvaging, stockpiling and re-spreading of topsoil to provide for a seedbed for the vegetation. This may be essential on sites where the constructed channel bottom will be in soils that are not capable of supporting the vegetation.
3. Spreading or otherwise using spoil generated by the construction of the waterway. Any spoil shall be spread or otherwise placed where it will not interfere with flow into the waterway, does not cause ponding, and has minimal potential for becoming a source of sediment.

If necessary, excess water may need to be diverted away from the waterway until vegetation is established. Once vegetation is established, any protective works shall then be removed, and the disturbed areas that are not to be farmed shall be seeded following guidance provided in, Critical Area Planting (342).

Vegetative Specifications

Information regarding seedbed preparation; time of seeding; seeding mixture and rate; stabilizing crop, mulching, or mechanical means of stabilizing; and fertilizer and lime requirements shall be specified for each applicable area. Vines and bunch grasses are not recommended for grassed waterways, because they are relatively

ineffective for controlling erosion caused by overland flow. All seedings specified shall be in accordance with the requirements of Pacific Basin standard, Critical Area Planting (342).

OPERATION AND MAINTENANCE

A maintenance program shall be established to maintain waterway capacity, vegetative cover, and outlet stability. Written operation and maintenance requirements must be provided to the cooperator when the approved design is presented for construction.

Items that should be addressed in operation and maintenance are:

1. Avoid using the waterway as a roadway.
2. Lift implement when crossing waterway.
3. Remove any obstacles (rock, weeds, etc.) from the waterway.
4. Inspect grassed waterways regularly, especially following heavy rains. Damaged areas shall be filled, compacted, and seeded immediately.
5. Vegetation damaged by machinery, herbicides, or erosion must be repaired promptly.
6. Remove sediment deposits to maintain capacity of grassed waterway.
7. At least once a month mow or graze vegetation to maintain capacity and reduce sediment deposition.

Seeding shall be protected from grazing until vegetation is established and any grazing after establishment shall be controlled so as not to be detrimental to the grasses. NRCS Pacific Basin State Resource Conservationist shall be consulted when grazing will be a maintenance activity.

Control noxious weeds and remove all woody vegetation.

The cooperator should be directed to contact the local NRCS office for assistance if the waterway experiences frequent or severe performance problems (flooding, erosion, poor vegetation vigor).

REFERENCES

1. USDA - NRCS - NEH Part 640 (Technical Release 62
2. USDA - NRCS - NEH Part 650 - Engineering Field Handbook
3. Section IV - Field Office Technical Guide
4. SCS - TP 61